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In the Claims

Applicants have submitted a new complete claim set showing marked-up claims with insertions indicated by underlining and deletions indicated by strikeouts and/or double bracketing.

Please cancel claims 1-60, 67, 97-99, and 102-110 without prejudice or disclaimer.

Please amend pending claims 61-65, 68, 72-76, 78, 82, 84, 85, 87-91, 100, and 111, as noted below.

Please add new dependent claims 112-153.

1- 60. (Cancelled)

61. (Currently amended) A reactor as in claim ~~58~~ 82, the chamber having a volume of less than about 100 microliters.

62. (Currently amended) A reactor as in claim ~~58~~ 82, the chamber having a volume of less than about 10 microliters.

63. (Currently amended) A reactor as in claim ~~58~~ 82, the chamber having a volume of less than about 5 microliters.

64. (Currently amended) A reactor as in claim ~~58~~ 82, the chamber having a volume of less than about 1 microliter.

65. (Currently amended) A reactor as in claim ~~58~~ 82, wherein the reaction unit comprises an etched portion of an article.

66. (Previously presented) A reactor as in claim 65, wherein the reaction unit chamber comprises etched silicon.

67. (Cancelled)

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1 68. (Currently amended) A reactor ~~as in claim 67~~, for carrying out a reaction involving at least one living cell, comprising:

a reaction unit including a chamber having a volume of less than 1 ml, an inlet for adding starting material to the chamber, and an outlet for release of a product of a reaction involving at least one living cell; and

a mixing unit fluidly connectable to the inlet of the chamber, the mixing unit including an outlet connectable to the inlet of the reaction chamber, a plurality of inlets each in fluid communication with the outlet and a mixing chamber between plurality of inlets and of the outlet.

69. (Previously presented) A reactor as in claim 68, wherein the mixing unit chamber is free of active mixing elements.

DI 70. (Previously presented) A reactor as in claim 69, wherein the mixing chamber is constructed and arranged to coalesce a plurality of reactant fluids provided through the plurality of inlets and to cause turbulence in the fluids thereby mixing and delivering a mixture of the reactant fluids through the outlet of the mixing chamber.

71. (Previously presented) A reactor as in claim 70, wherein the mixing unit includes a fluid flow path between the plurality of inlets and the outlet and a plurality of obstructions in the flow path constructed to cause mixture of fluid flowing through the flow path.

72. (Currently amended) A reactor ~~as in claim 67~~ for carrying out a reaction involving at least one living cell, comprising:

2 a reaction unit including a chamber having a volume of less than 1 ml, an inlet for adding starting material to the chamber, and an outlet for release of a product of a reaction involving at least one living cell; and

a mixing unit fluidly connectable to the inlet of the chamber, wherein the mixing unit is attachable to and separable from the reaction unit.

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73. (Currently amended) A reactor as in claim ~~67~~ 68, wherein the mixing chamber includes a volume, between the plurality of inlets and the outlet, of less than 1 liter.

74. (Currently amended) A reactor as in claim ~~67~~ 68, wherein the mixing chamber includes a volume, between the plurality of inlets and the outlet, of less than 10 microliters.

3 75. (Currently amended) A reactor ~~as in claim 58~~, for carrying out a reaction involving at least one living cell, comprising:

a reaction unit including a chamber having a volume of less than 1 ml, an inlet for adding starting material to the chamber, and an outlet for release of a product of a reaction involving at least one living cell; and

further comprising a heating unit having an inlet, and an outlet connectable to the inlet of the reaction chamber, the heating unit separable from and attachable to the reaction chamber.

DI 76. (Currently amended) A reactor as in claim ~~58~~ 75, ~~further comprising a heating unit having an inlet, and an outlet connectable to the inlet of the reaction chamber, the heating unit separable from and attachable to the reaction chamber.~~ wherein the outlet of the heating unit is fluidly connectable to the inlet of the reaction chamber,

77. (Previously presented) A reactor as in claim 76, wherein the heating unit includes an inlet, and a plurality of outlets fluidly connected to the inlet.

4 78. (Currently amended) A reactor ~~as in claim 58~~, for carrying out a reaction involving at least one living cell, comprising:

a reaction unit including a chamber having a volume of less than 1 ml, an inlet for adding starting material to the chamber, and an outlet for release of a product of a reaction involving at least one living cell; and

further comprising a heating and dispersion unit having an inlet, and an outlet connectable to the inlet of the reaction chamber, the heating and dispersion unit separable from and attachable to the reaction chamber.

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79. (Previously presented) A reactor as in claim 78, wherein the heating and dispersion unit includes an inlet and a plurality of outlets connected to the inlet.

80. (Previously presented) A reactor as in claim 79, further comprising a mixing unit having a plurality of inlets communicating with a mixing chamber, the mixing chamber communicating with an outlet, wherein the outlets of the heating and dispersion units are connectable to the inlet of the reactor, and the inlet of the heating and dispersion unit is connectable to the outlet of the mixing unit.

81. (Previously presented) A reactor as in claim 78, wherein the dispersion unit is constructed and arranged to maintain fluid exiting the unit through the plurality of outlets at a temperature of approximately 30 °C.

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82. (Currently amended) A reactor ~~as in claim 58~~, for carrying out a reaction involving at least one living cell, comprising:
a reaction unit including a chamber having a volume of less than 1 ml, an inlet for adding starting material to the chamber, and an outlet for release of a product of a reaction involving at least one living cell, wherein the reaction chamber is constructed and arranged for cell cultivation.

83. (Previously presented) A reactor as in claim 82, wherein the reaction chamber has a surface adapted for immobilization of at least one cell.

84. (Currently amended) A reactor as in claim ~~58~~ 82, further comprising a separation unit having an inlet and an outlet, the inlet connectable to the outlet of the reaction chamber.

85. (Currently amended) A reactor as in claim ~~84~~ 87, wherein the separation unit is connectable to and removable from the reaction chamber.

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86. (Previously presented) A reactor as in claim 84, wherein the separation unit includes an inlet connectable to the outlet of the reaction chamber, a carrier fluid outlet, a fluid pathway connecting the inlet with the carrier fluid outlet, and a size-selective membrane positioned to contact fluid flowing from the inlet to the fluid carrier outlet.

87. (Currently amended) A reactor ~~as in claim 86~~, for carrying out a reaction involving at least one living cell, comprising:

a reaction unit including a chamber having a volume of less than 1 ml, an inlet for adding starting material to the chamber, and an outlet for release of a product of a reaction involving at least one living cell; and

a separation unit having an inlet and an outlet, the inlet connectable to the outlet of the reaction chamber, the separation unit having a carrier fluid outlet, a fluid pathway connecting the inlet with the carrier fluid outlet, and a size-selective membrane positioned to contact fluid flowing from the inlet to the fluid carrier outlet,

wherein the membrane has a first side positioned to contact fluid flowing from the inlet to the fluid flow outlet and an opposing second side defining in part a product extraction solvent flow pathway.

88. (Currently amended) A reactor ~~as in claim 86~~, for carrying out a reaction involving at least one living cell, comprising:

a reaction unit including a chamber having a volume of less than 1 ml, an inlet for adding starting material to the chamber, and an outlet for release of a product of a reaction involving at least one living cell; and

a separation unit having an inlet and an outlet, the inlet connectable to the outlet of the reaction chamber, the separation unit having wherein the a carrier fluid outlet is connectable to a recovery container for recycling of reaction carrier fluid, a fluid pathway connecting the inlet with the carrier fluid outlet, and a size-selective membrane positioned to contact fluid flowing from the inlet to the fluid carrier outlet.

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89. (Currently amended) A reactor as in claim ~~58~~ 68, further comprising at least one sensor of temperature, pH, oxygen concentration, or pressure.

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90. (Currently amended) A reactor ~~as in claim 89~~, for carrying out a reaction involving at least one living cell, comprising:

a reaction unit including a chamber having a volume of less than 1 ml, an inlet for adding starting material to the chamber, and an outlet for release of a product of a reaction involving at least one living cell, the reactor comprising sensors of each of temperature, pH, and oxygen concentration.

91. (Currently amended) A reactor as in claim ~~58~~ 82, including a plurality of reaction chambers, attachable to and separable from each other, constructed and arranged to operate in parallel.

92. (Previously presented) A reactor as in claim 91, comprising at least 10 reaction chambers constructed to operate in parallel.

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93. (Previously presented) A reactor as in claim 91, comprising at least 100 reaction chambers constructed to operate in parallel.

94. (Previously presented) A reactor as in claim 91, comprising at least 500 reaction chambers constructed to operate in parallel.

95. (Previously presented) A reactor as in claim 91, comprising at least 1,000 reaction chambers constructed to operate in parallel.

96. (Previously presented) A reactor as in claim 91, comprising at least 10,000 reaction chambers constructed to operate in parallel.

97. (Cancelled)

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98. (Cancelled)

99. (Cancelled)

100. (Currently amended) A reactor as in claim ~~58~~ 82, further comprising a collection chamber connectable to the outlet of the reaction chamber.

101. (Previously presented) A reactor as in claim 100, wherein the collection chamber has a volume of greater than about one liter.

102-110. (Cancelled)

111. (Currently amended) A reactor as in claim ~~58~~ 68, further comprising temperature control elements constructed and arranged to control temperature at at least one portion of the reactor.

DI 112. (New) A reactor as in claim 68, the chamber having a volume of less than about 100 microliters.

113. (New) A reactor as in claim 72, the chamber having a volume of less than about 100 microliters.

114. (New) A reactor as in claim 75, the chamber having a volume of less than about 100 microliters.

115. (New) A reactor as in claim 78, the chamber having a volume of less than about 100 microliters.

116. (New) A reactor as in claim 87, the chamber having a volume of less than about 100 microliters.

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¹¹⁷
127. (New) A reactor as in claim 72, further comprising at least one sensor of temperature, pH, oxygen concentration, or pressure.

¹¹⁸
128. (New) A reactor as in claim 75, further comprising at least one sensor of temperature, pH, oxygen concentration, or pressure.

¹¹⁹
129. (New) A reactor as in claim 78, further comprising at least one sensor of temperature, pH, oxygen concentration, or pressure.

¹²⁰
130. (New) A reactor as in claim 82, further comprising at least one sensor of temperature, pH, oxygen concentration, or pressure.

¹²¹
131. (New) A reactor as in claim 87, further comprising at least one sensor of temperature, pH, oxygen concentration, or pressure.

¹²²
132. (New) A reactor as in claim 88, further comprising at least one sensor of temperature, pH, oxygen concentration, or pressure.

¹²³
133. (New) A reactor as in claim 68, including a plurality of reaction chambers, attachable to and separable from each other, constructed and arranged to operate in parallel.

¹²⁴
134. (New) A reactor as in claim 72, including a plurality of reaction chambers, attachable to and separable from each other, constructed and arranged to operate in parallel.

¹²⁵
135. (New) A reactor as in claim 75, including a plurality of reaction chambers, attachable to and separable from each other, constructed and arranged to operate in parallel.

¹²⁶
136. (New) A reactor as in claim 78, including a plurality of reaction chambers, attachable to and separable from each other, constructed and arranged to operate in parallel.

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~~127~~
~~147.~~ (New) A reactor as in claim 72, further comprising temperature control elements constructed and arranged to control temperature at at least one portion of the reactor.

~~128~~
~~148.~~ (New) A reactor as in claim 75, further comprising temperature control elements constructed and arranged to control temperature at at least one portion of the reactor.

~~129~~
~~149.~~ (New) A reactor as in claim 78, further comprising temperature control elements constructed and arranged to control temperature at at least one portion of the reactor.

~~130~~
~~150.~~ (New) A reactor as in claim 82, further comprising temperature control elements constructed and arranged to control temperature at at least one portion of the reactor.

~~131~~
~~151.~~ (New) A reactor as in claim 87, further comprising temperature control elements constructed and arranged to control temperature at at least one portion of the reactor.

~~132~~
~~152.~~ (New) A reactor as in claim 88, further comprising temperature control elements constructed and arranged to control temperature at at least one portion of the reactor.

~~133~~
~~153.~~ (New) A reactor as in claim 90, further comprising temperature control elements constructed and arranged to control temperature at at least one portion of the reactor.

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